

**CORRECTING FOR ATTENUATION
EFFECTS IN OPTICAL PATTERNATION OF
SPRAYS**

DEMONSTRATION OF CORRECTION
METHODOLOGY DEVELOPED BY
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20021030 064

AIR FORCE CONTRACT F04611-97-C-0084

Distribution statement: Approved for public release; distribution unlimited.

MOTIVATION

- “OPTICAL PATTERNATION” OF SPRAYS
 - PLANAR LASER INDUCED FLUORESCENCE APPROACH
 - DISTRIBUTION OF MASS THROUGHOUT SPRAY
 - NON-INTRUSIVE
 - RAPID
 - GAINING ACCEPTANCE AS SPRAY DIAGNOSTIC
- BARRIERS TO QUANTITATIVE RESULTS
 - CAMERA RESPONSE ISSUES
 - ATTENUATION OF EXCITING LIGHT
 - ATTENUATION OF SIGNAL LIGHT

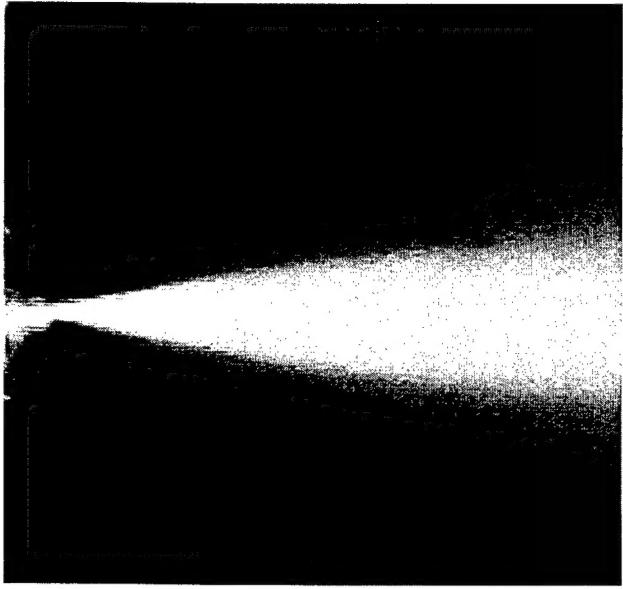
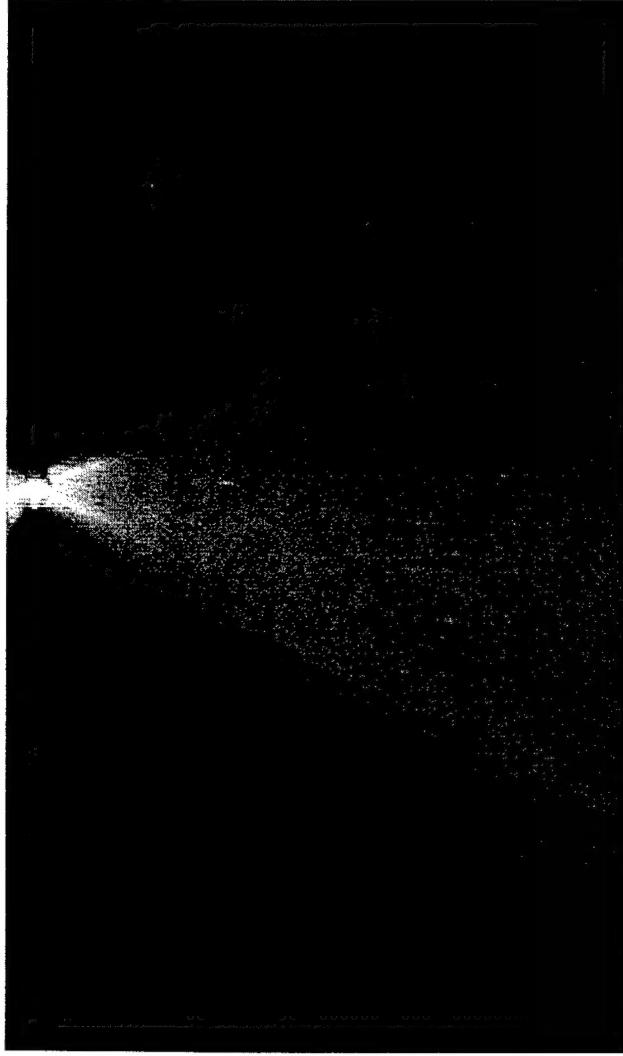
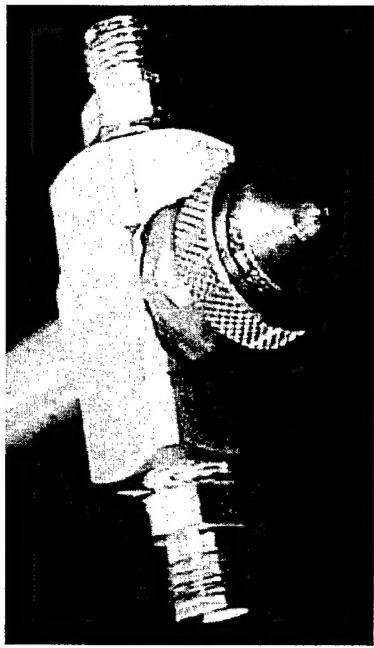
ADDRESSING BARRIERS

- NOVEL METHODOLOGY HAS BEEN DEVELOPED TO SIMULTANEOUSLY ACCOUNT FOR ATTENUATION OF
 - EXCITATION LIGHT
 - SIGNAL LIGHT

DEMONSTRATION STUDY

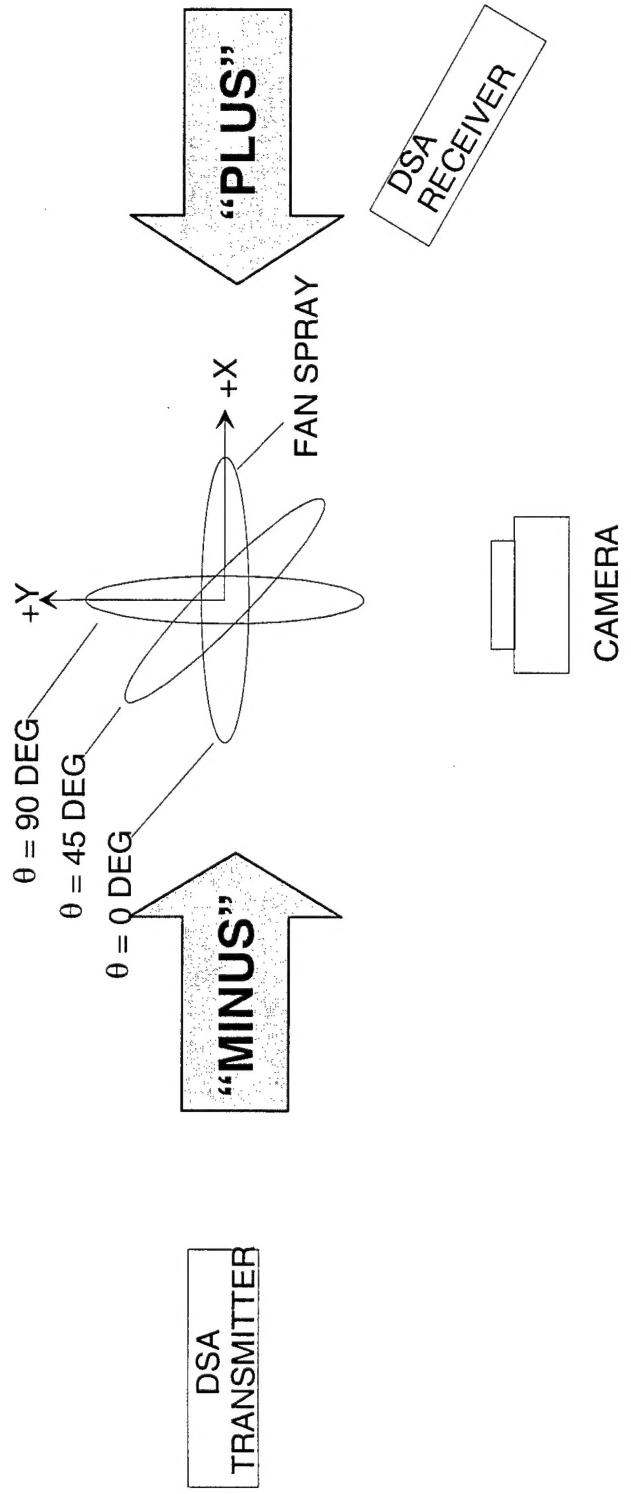
TWIN-FLUID FAN SPRAY:

- CONTROLLED ATTENUATION EFFECTS
- SYMMETRIC ELLIPTIC DISTRIBUTION



DEMONSTRATION STUDY

- TOP VIEW ORIENTATION

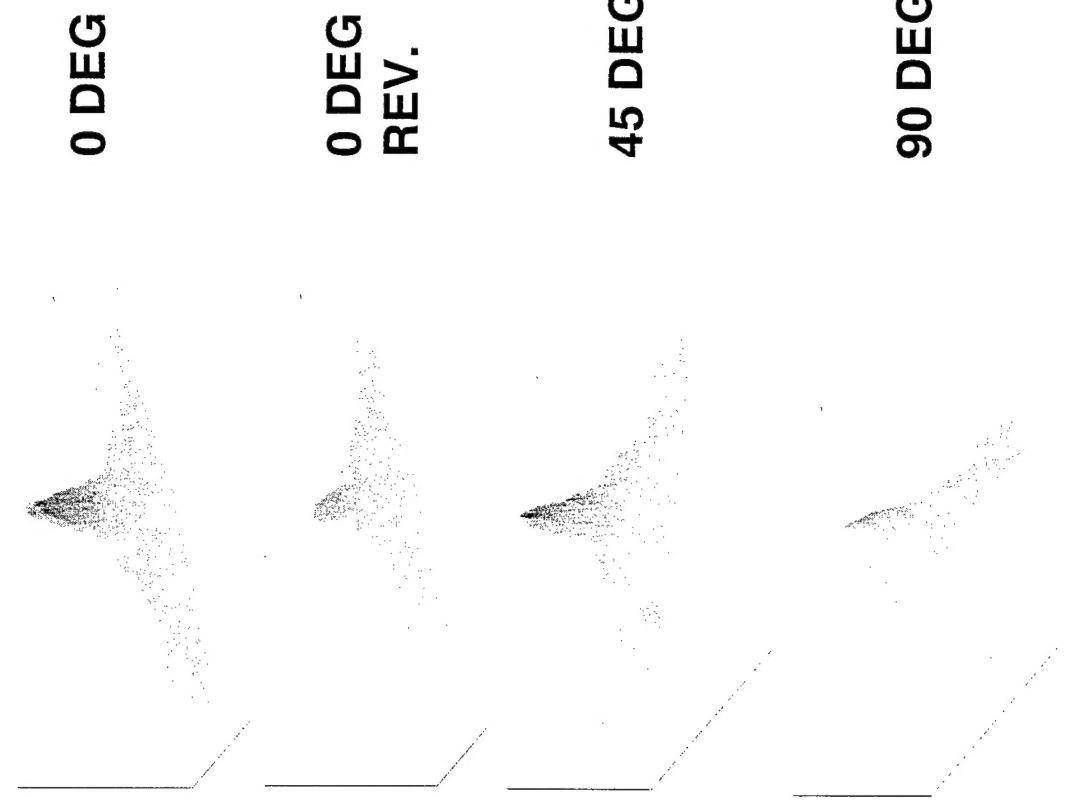
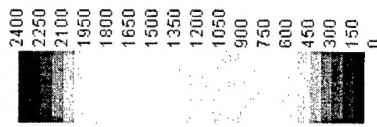
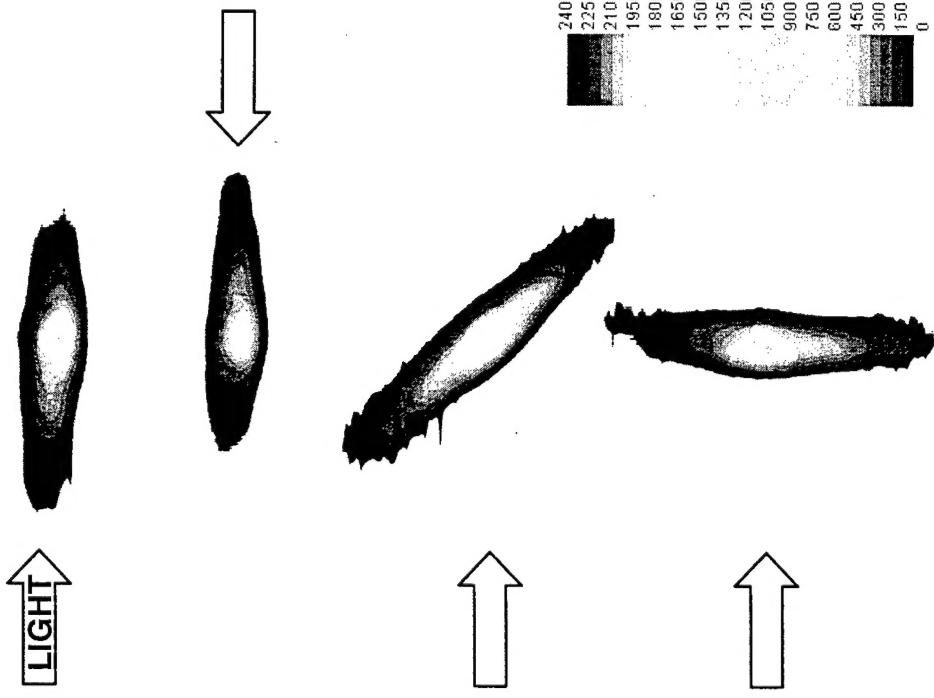


ATTRIBUTES:

- 0-DEG: MAXIMUM INCIDENT LIGHT ATTENUATION
- 90-DEG: MAXIMUM SIGNAL ATTENUATION
- 45-DEG: MINIMUM INCIDENT LIGHT OR SIGNAL ATTENUATION

DEMONSTRATION STUDY

- UNCORRECTED IMAGES



DEMONSTRATION STUDY

- IMPORTANCE OF CORRECTION: UPPER AND LOWER IMAGES SHOULD BE IDENTICAL BUT ROTATED

CORRECTION FOR
INCIDENT LIGHT
ONLY



PRESENT FULL
CORRECTION



UNCORRECTED



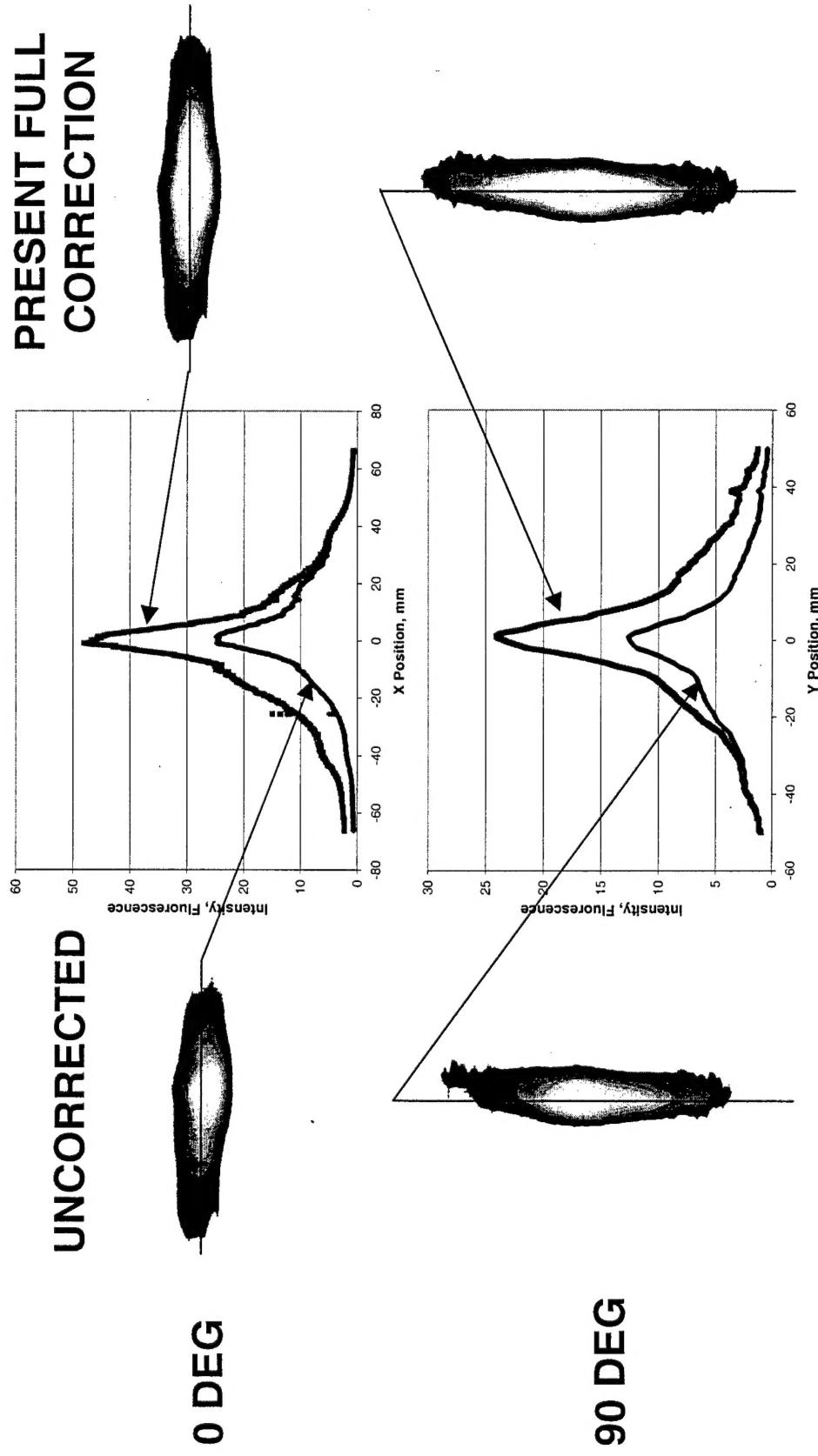
0 DEG



90 DEG

DEMONSTRATION STUDY

- IMPORTANCE OF CORRECTION: LINE PROFILES



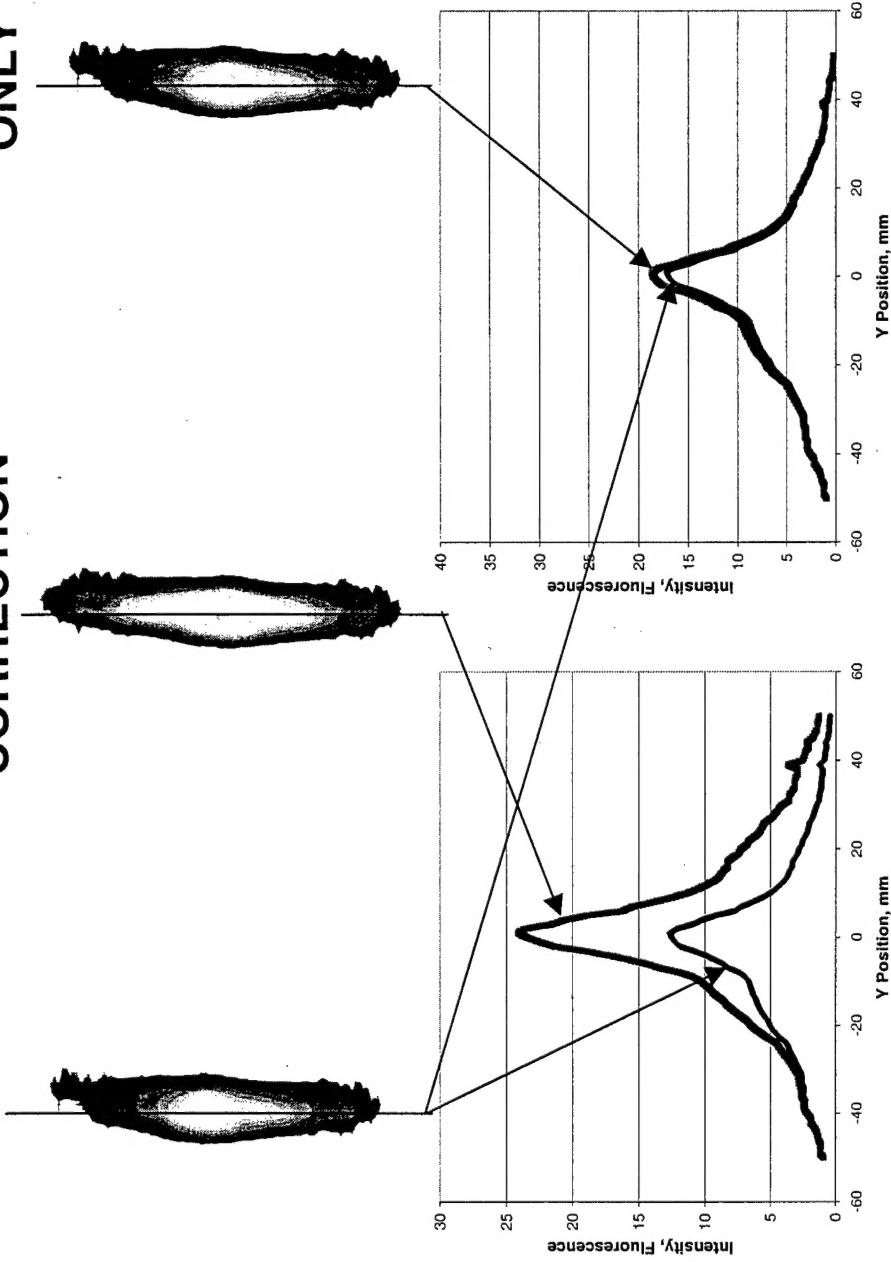
DEMOnSTRATION STUDY

- IMPORTANCE OF CORRECTION FOR SIGNAL: 90 DEG ORIENTATION

**CORRECTION FOR
INCIDENT LIGHT
ONLY**

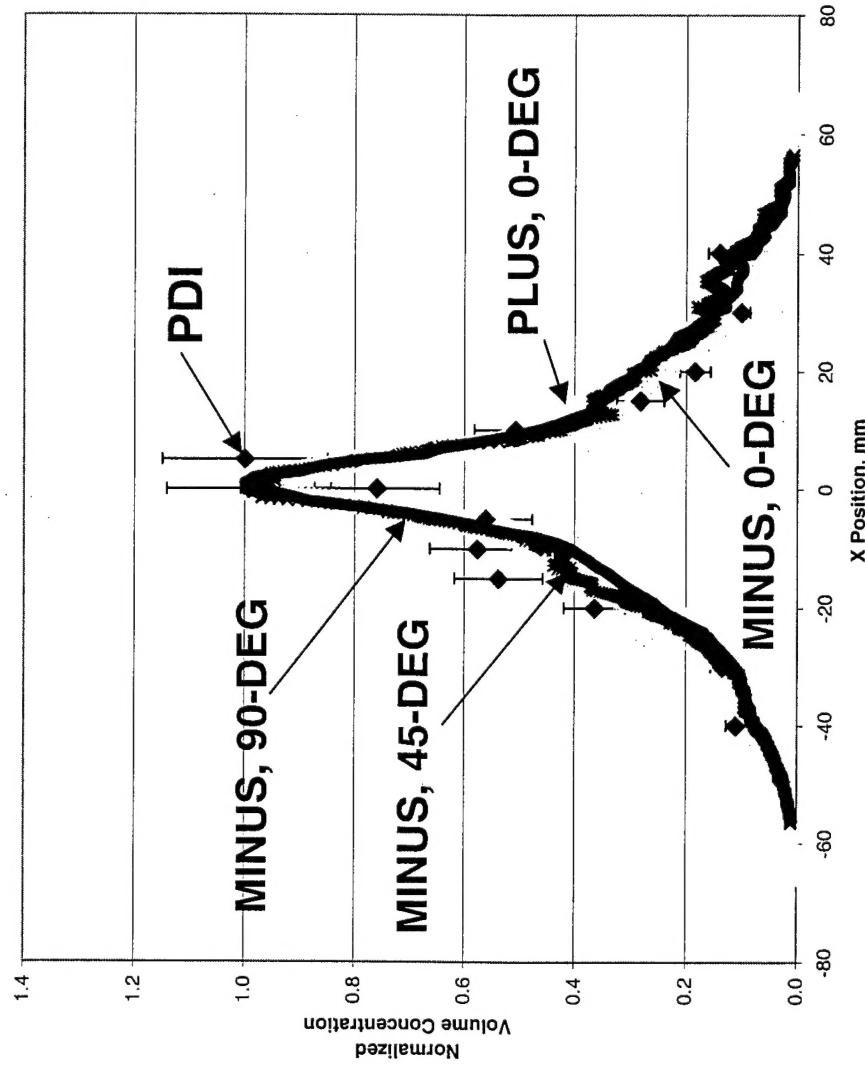
**PRESENT FULL
CORRECTION**

UNCORRECTED



DEMONSTRATION STUDY

- COMPARISON OF CORRECTED VOLUME CONCENTRATION TO PDI



CONCLUSIONS

- CORRECTION REQUIRED FOR ACCURATE RESULTS IN SPRAYS WITH SIGNIFICANT OPTICAL THICKNESS
 - INCIDENT LIGHT
 - SIGNAL LIGHT
- METHODOLOGY HAS BEEN DEVELOPED TO ACCOUNT FOR ATTENUATION OF BOTH INCIDENT AND SIGNAL LIGHT
- DEMONSTRATIONS TO DATE HAVE REVEALED GOOD PERFORMANCE
 - 63% “OBSCURATION”

OSDSBEUV

MEMORANDUM FOR PR (Contractor/In-House Publication)

FROM: PROI (TI) (STINFO)

23 Jun 2000

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-TP-2000-140**
V. McDonel (ERC); D. Talley (AFRL/PRSA), "Correcting for Attenuation Effects in Optical
Patterning of Sprays"

10th International Symposium on Applications of Laser Techniques to Fluid (Statement A)

Mechanics (Lisbon, Portugal, 10-13 Jul 00)

8th International Conference on Liquid Atomization and Spray Systems

(Pasadena, CA, 16-20 June 00) (Submission Deadline: 19 Jun 00)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.

Comments: _____

Signature _____ Date _____

2. This request has been reviewed by the Public Affairs Office for: a.) appropriateness for public release and/or b) possible higher headquarters review.

Comments: _____

Signature _____ Date _____

3. This request has been reviewed by the STINFO for: a.) changes if approved as amended, b.) appropriateness of distribution statement, c.) military/national critical technology, d.) economic sensitivity, e.) parallel review completed if required, and f.) format and completion of meeting clearance form if required

Comments: _____

Signature _____ Date _____

4. This request has been reviewed by PR for: a.) technical accuracy, b.) appropriateness for audience, c.) appropriateness of distribution statement, d.) technical sensitivity and economic sensitivity, e.) military/national critical technology, and f.) data rights and patentability

Comments: _____

APPROVED/APPROVED AS AMENDED/DISAPPROVED

LESLIE S. PERKINS, Ph.D

(Date)

Staff Scientist

Propulsion Directorate

2002 1030 064